

**WHAT IS CLAIMED IS:**

1. A hydrogenation catalyst represented by the following formula 1:

Formula 1



5            wherein a, b, c, and d are represented on the basis of weight, wherein a is 20 to 90, b is 0.01 to 10, c is 0.01 to 5, and d is 5 to 50.

2. A method for the preparation of a hydrogenation catalyst according to Claim 1, comprising the steps of:

              (1) coprecipitating copper, zinc, and manganese components into the  
10    form of hydro gel by preparing a mixed aqueous solution of copper salt, zinc salt, and manganese salt and then applying an aqueous alkali solution thereto;

              (2) adding a nanosized silica to the thus produced coprecipitate;

              (3) hydrothermally aging the slurry mixture; and selectively,

              (4) filtering the aged slurry solution to isolate a precipitate and rinsing it;

15    and

              (5) drying and forming the rinsed precipitate.

3. The method of claim 2 characterized in that the temperature of the slurry solution of (1) is in the range of 1 to 30°C and its pH is maintained in the range of 6 to 9.

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4. The method of claim 2 characterized in that the nanosized silica of (2) is a

colloidal silica and the colloidal silica is stabilized with ammonium ions ( $\text{NH}_4^+$ ) or sodium ions ( $\text{Na}^+$ ), or other alkali metals, and it has a particle size of 4~60 nm, a surface area of 100~600  $\text{m}^2/\text{g}$ , and a concentration within 1 to 60% by weight on the basis of the silica.

- 5 5. The method of claim 2 characterized in that the aging process of (3) is carried out at 50 to 100°C for 0.5 hours or longer.
6. The method of claim 2 characterized in that in the rinsing of (4), the remaining amount of alkali metals is regulated in an amount of 1000 ppm or less.
7. The method of claim 2 characterized by further comprising a process of
- 10 calcining the formed catalyst at 200 to 900°C for 2 to 10 hours.
8. The method of claim 2 characterized in that in step (5), the dried parental powder is impregnated onto a carrier having a porosity of not less than 40% and a specific surface area of not more than 1  $\text{m}^2/\text{g}$ , in an amount of 5 to 40% by weight.
9. The method of claim 2 characterized in that in step (5), the precipitated cake is
- 15 obtained and then directly formed by extrusion such that its hydration ratio is within a range of 45 to 50%.
10. The method of claim 2 characterized in that in step (5), the powder, which is obtained after spray drying, is formed by tableting it.
11. A method for preparing gamma-butyrolactone by hydrogenating maleic
- 20 anhydride in the presence of the catalyst represented by formula 1 according to claim 1.

12. The method of claim 11 characterized in that the catalyst in an impregnated form is fed to the inlet portion of a reactor in a range of 1/10 to 1/2 of the total catalyst layer.

13. The method of claim 11 characterized in that before the hydrogenation, the catalyst is activated with hydrogen or a hydrogen-containing gas at 150 to 450°C for 1 to 20 hours.

14. The method of claim 11 characterized in that the hydrogenation is carried out under the conditions of a reaction pressure of 1 to 20 atmospheres, a reaction temperature of 200 to 400°C, and a molar ratio of hydrogen with regard to maleic anhydride of 20:1 to 100:1.

15. The method of claim 11 characterized in that the maleic anhydride is supplied in the evaporated form of a molten maleic anhydride or a gamma-butyrolactone solution containing 20 to 70 wt.% of maleic anhydride.